

## CLAIMS

1. Method for determining in a person's exhalation  
5 air the concentration of a specific substance in the blood  
by measuring the concentration of said substance and the  
concentration of water vapour in the exhalation air and  
utilizing a known relationship between these concentra-  
tions, **characterized** in that the person's face is flushed  
10 in an air stream of predetermined composition, that the  
exhalation air is exhaled freely into a defined air volume  
having said predetermined composition, and that said  
concentrations are measured in this air volume.

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## CLAIMS

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(1.) Method for determining in a person's exhalation air the concentration of a specific substance in the blood by measuring the concentration of said substance and the concentration of water vapour in the exhalation air and utilizing a known relationship between these concentrations, **characterized in** that the exhalation air is exhaled freely in a defined air volume having a predetermined composition, and that said concentrations are measured in this air volume.

2. Method according to claim 1 **characterized in** that the measurement of said concentrations is effected by quantitative detection by means of a light beam preferably a beam of infrared light which is sent through the air volume towards a detector.

(3.) Method according to claim 1 or 2 **characterized in** that the air in the air volume comprises surrounding air from a space wherein the air has predetermined concentrations of water vapour and said specific substance.

(4.) Method according to claim 3 **characterized in** that the air in said space is dry.

(5.) Method according to <sup>claim 1</sup> ~~any of claims 1 to 4~~ **characterized in** that the air volume comprises a constant or intermittent air flow.

(6.) Method according to claim 5 **characterized in** that the air flow is passed through a defined flow passage.

(7.) Method according to claim 6 **characterized in** that the exhalation air is directed as an air jet towards and into the flow passage.

(8.) Method according to claim 7 **characterized in** that the exhalation air is supplied to the flow passage together with the air flow.

(9.) Method according to any of claims 6 to 8 **characterized in** that the flow passage is kept heated in order to prevent condensation therein.

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10. Method according to <sup>claim 1</sup> ~~any of claims 1 to 9~~ characterized in that the concentration of carbon dioxide in the exhalation air is measured and that the measurement of the concentration of said substance and the concentration of water vapour is initiated first at a predetermined measured value of the concentration of carbon dioxide.

11. Apparatus for determining in a person's exhalation air the concentration of a specific substance in the blood by measuring the concentration of said substance and the concentration of water vapour in the exhalation air and utilizing of a known relationship between these concentrations, ~~by the method according to any of claims 1 to 10,~~ characterized by a device (16; 31) which defines a space for receiving exhalation air under free exhalation in the space which has two mutually opposite openings through which the space communicates with the surrounding air, and means (18, 22, 23; 34, 35, 35) for selective quantitative detection of said substance in the air in the defined space.

12. Apparatus according to claim 11 characterized in that means are provided for supplying an air flow through one of said opposite openings.

13. Apparatus according to claim 11 characterized in that the device defining said space comprises a tube (16) open at both ends for exhalation air flow from one end to the other, said tube being mounted coaxially in a cuvette (10) which is open at one end thereof, said one end of the tube being located axially inwardly of the open end of the cuvette, and that means (14, 15) are connected to an annular gap defined between the tube (16) and the cuvette (10), for supplying air to said gap which communicates with the tube at said one end thereof.

14. Apparatus according to claim 13 characterized in that the gap communicates also with said one end of the cuvette (10).

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15. Apparatus according to claim 14 **characterized in** that means (15') are connected to said other end of the tube (16) for drawing exhalation air through the tube, these means as well as said means (14, 15) for supplying  
5 air to the gap being alternately operative.

16. Apparatus according to claim 14 or 15 **character-  
ized in** that said one end of the cuvette (10) is provided with a rim (13) defining an injection opening (12) and is constructed to deviate the air supplied through the gap,  
10 towards said one end of the tube (16).

17. Apparatus according to claim 16 **characterized by** a mouthpiece (30) which is exchangeably inserted into the injection opening (12).

18. Apparatus according to claim 17 **characterized in** that the mouthpiece (30) is constructed to close the connection between the gap and said one end of the tube (16).  
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19. Apparatus according to ~~any of claims 13 to 18~~ <sup>claim 13</sup> **characterized in** that said means for selective quantity detection comprises a radiation source (18) at said one end  
20 of the tube (16) for emission of a light beam axially through the tube (16), and a detector (23) with filters (22) at said other end of the tube (16).

20. Method for determining indirectly in a person's exhalation air the concentration of a specific substance in  
25 the blood by measuring the concentration of said substance and the concentration of water vapour in the exhalation air, and utilizing a known relationship between these concentrations the exhalation air being exhaled as undiluted alveolar gas at one end of a defined flow passage and said  
30 concentrations being determined by measuring the undiluted alveolar gas in the flow passage, **characterized in** that the exact evaporation temperature of the alveolar gas is determined, and that the concentration of said substance in the blood is determined according to said relationship with

consideration of deviation of the predetermined evaporation temperature from a normal value.

21. Method according to claim 20 **characterized in** that the normal value is the normal body temperature 37°C.

5 22. Method according to claim 20 or 21 **characterized in** that a reference gas of a predetermined composition before measuring the undiluted alveolar gas is passed through the flow passage, and that said concentrations are determined by measuring the alveolar gas for calibration of  
10 the measurement equipment used for the measurement.

23. Method according to claim 22 **characterized in** that the reference gas is passed through the flow passage after measuring the undiluted alveolar gas, and that the measurement of the reference gas is repeated for control of  
15 the calibration.

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